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Patentanmeldung Nr. Patent application No. Demande de brevet n°

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Der Präsident des Europäischen Patentamts;
Im Auftrag

For the President of the European Patent Office

Le Président de l'Office européen des brevets
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(Falls die Bezeichnung der Erfindung nicht angegeben ist, siehe Beschreibung.
If no title is shown please refer to the description.
Si aucun titre n'est indiqué se referer à la description.)

A shaving device with a pivotable shaving head carrying an actively driven cutting member

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PT RO SE SI SK TR LI

A shaving device with a pivotable shaving head carrying an actively driven cutting member

The invention relates to a device for shaving hairs growing from skin, comprising a base portion having a grip, a shaving head carrying at least one blade-shaped cutting member having at least one cutting edge, and an actuator for effecting a periodical motion of the cutting member relative to the base portion.

The invention also relates to a shaving head suitable for use in a device for shaving hairs growing from skin, the shaving head carrying at least one blade-shaped cutting member having at least one cutting edge, the shaving head further comprising a coupling member by means of which the shaving head can be coupled to a base portion of said device, said base portion comprising a grip and an actuator for effecting a periodical motion of the cutting member relative to the base portion.

A device for shaving hairs of the kind mentioned in the opening paragraphs is known from US-A-2,054,418. The shaving head of the known device comprises a blade-shaped cutting member. The actuator of the known device comprises an electric motor, which is arranged in the base portion and has a shaft to which a fly wheel is eccentrically secured. The fly wheel is located in the shaving head of the known device and extends substantially parallel to the main surfaces of the cutting member. The shaft is supported by two bearings, one of which is also arranged in the shaving head. During operation, when the fly wheel is rotated by the motor, the fly wheel exerts periodical forces on the bearings. Via the bearing arranged in the shaving head, said forces are transmitted to the shaving head and effect a circular periodical motion of the shaving head and of the cutting member mounted therein relative to the base portion. The circular periodical motion of the cutting member takes place substantially in an imaginary plane parallel to the main surfaces of the cutting member. As a result of said periodical motion of the cutting member, the device has an improved hair cutting action.

A disadvantage of the known device for shaving hairs is that the risk of skin irritations and skin injuries is considerably increased as a result of the periodical motion of the cutting member.

It is an object of the invention to provide a device for shaving hairs and a shaving head of the kinds mentioned in the opening paragraphs which have an improved hair cutting action as a result of the periodical motion of the blade-shaped cutting member, but which have a smaller risk of skin irritations and skin injuries.

In order to achieve said object, a device for shaving hairs in accordance with the invention is characterized in that the shaving head is pivotable relative to the base portion about a pivot axis, and the periodical motion of the cutting member is a periodical motion relative to the shaving head.

In order to achieve said object, a shaving head in accordance with the invention is characterized in that the periodical motion of the cutting member is a periodical motion relative to the shaving head, and the shaving head comprises a pivot member by means of which, in a condition mounted to the base portion, the shaving head is pivotable relative to the base portion about a pivot axis.

The invention is based on the insight that, for a shaving device wherein the blade-shaped cutting member performs a periodical motion, the risk of skin irritations and skin injuries is considerably reduced if the geometrical path, which is followed by the cutting member during the periodical motion, has a well-defined position and orientation with respect to the skin surface. Since in accordance with the invention the shaving head is pivotable relative to the base portion, the position and orientation of said geometrical path are less dependent on or even independent of the position and orientation of the base portion with respect to the skin surface, so that the position and orientation of said geometrical path are less dependent on the manner in which the user holds the grip in his hand and holds his hand with respect to the skin surface. As a result of said pivot axis, the position and orientation of said geometrical path are mainly determined by the contact forces between the shaving head and the skin surface. Said contact forces lead to a pivotal motion of the shaving head about the pivot axis into a position, in which the shaving head is in optimum contact with the skin and in which, accordingly, the geometrical path of the cutting member has a well-defined position and orientation with respect to the skin surface. Since in addition the periodical motion of the cutting member is a periodical motion relative to the shaving head, the shaving head is stationary with respect to the base portion apart from pivotal motions about said pivot axis. As a result, the position and orientation of the geometrical path of the periodical motion of the cutting member relative to the skin are even better defined.

A particular embodiment of a device for shaving hairs in accordance with the invention is characterized in that the shaving head comprises a skin contact member defining a skin contact surface, the pivot axis extending substantially parallel to the skin contact surface. As a result, the shaving head has a further improved skin-contour following ability, so that the position and orientation of the geometrical path of the periodical motion of the cutting member with respect to the skin surface are even better defined and the risk of skin irritations and skin injuries is further reduced.

A particular embodiment of a device for shaving hairs in accordance with the invention is characterized in that the periodical motion has a motion component which extends substantially parallel to a main cutting direction of the cutting member, the pivot axis extending substantially perpendicularly to the main cutting direction. The hair cutting action of the device is considerably improved as a result of said motion component extending parallel to the main cutting direction, and said orientation of the pivot axis perpendicular to the main cutting direction, i.e. parallel to said motion component, provides an optimum skin-contour following ability of the shaving head having said motion component.

A further embodiment of a device for shaving hairs in accordance with the invention is characterized in that the periodical motion is a reciprocating motion in a direction substantially parallel to the main cutting direction. The hair cutting action of the device is further improved as a result of said reciprocating motion in said direction substantially parallel to the main cutting direction.

A further embodiment of a device for shaving hairs in accordance with the invention is characterized in that the cutting member comprises a single straight cutting edge, the pivot axis extending parallel to the cutting edge and, seen in the main cutting direction, being arranged in front of the cutting edge. In this manner, for a shaving head with a blade-shaped cutting member having a single straight cutting edge, it is achieved that the contact pressure between the cutting edge of the cutting member and the skin is less dependent on the force with which the user presses the shaving head on the skin. As a result, the shaving performance and the shaving comfort of the device are less dependent on said force exerted by the user.

A particular embodiment of a device for shaving hairs in accordance with the invention is characterized in that the device further comprises a pretensioning member which defines a skin contact pressure exerted by the cutting member on the skin during operation. As a result of said pretensioning member, it is achieved that the contact pressure between the cutting edge of the cutting member and the skin is less dependent on the force with which the

user presses the shaving head on the skin. As a result, the shaving performance and the shaving comfort of the device are less dependent on said force exerted by the user.

A further embodiment of a device for shaving hairs in accordance with the invention is characterized in that the pretensioning member comprises a mechanical spring mounted to the shaving head and to the base portion for exerting a pretensioning mechanical torque on the shaving head about the pivot axis. In this embodiment, the pretensioning member has a simple, practical and effective structure.

A particular embodiment of a device for shaving hairs in accordance with the invention is characterized in that the actuator is arranged in the base portion and effects the periodical motion of the cutting member via a transmission system which is partially arranged in the base portion and partially arranged in the shaving head. In this manner, the structure of the shaving head is simplified and the dimensions of the shaving head are considerably reduced. As a result, the shaving head is particularly suitable to be constructed as a detachable shaving head, which can be removed from the base portion and exchanged by a new shaving head when the cutting member is worn out.

A particular embodiment of a device for shaving hairs in accordance with the invention is characterized in that the shaving head is releasably mounted to the base portion. In this embodiment, the shaving head can be removed from the base portion and exchanged by a new shaving head when the cutting member is worn out.

A particular embodiment of a device for shaving hairs in accordance with the invention is characterized in that the cutting member is releasably mounted to the shaving head. In this embodiment, the cutting member can be removed from the shaving head and exchanged by a new cutting member when the cutting member is worn out.

In the following, embodiments of a device for shaving hairs in accordance with the invention and of a shaving head in accordance with the invention will be described in detail with reference to the accompanying figures, in which

Fig. 1 schematically shows an embodiment of a device for shaving hairs in accordance with the invention;

Fig. 2 shows the device of Fig. 1 in more detail;

Fig. 3 shows a portion of a shaving head in accordance with the invention used in the device of Fig. 2;

Fig. 4 is a side view of the shaving head of the device of Fig. 2; and

Fig. 5 shows a coupling and pivot member of the shaving head of the device of Fig. 2.

Fig. 1 only schematically shows the main parts of an embodiment of a device 1 for shaving hairs in accordance with the invention. The device 1 comprises a base portion 3 having a grip 5 by means of which a user of the device 1 can hold the device 1 in his hand. The device 1 further comprises a shaving head 7 which, in this embodiment, carries two cutting members 9, 11. The cutting members 9, 11 each comprise a cutting blade 10, 12. The cutting blades 10, 12 extend substantially parallel to each other and each comprise a single straight cutting edge 13, 15. The cutting edges 13, 15 define a main cutting direction or shaving direction X of the shaving head 7 extending substantially perpendicularly to the cutting edges 13, 15. The shaving head 7 further comprises a skin contact member 17 comprising a skin stretching element 19, which is arranged in front of the cutting members 9, 11 seen in the shaving direction X, and a skin lubricating element 21, which is arranged behind the cutting members 9, 11 seen in the shaving direction X. The skin stretching element 19 and the skin lubricating element 21 together define a skin contact surface 23 via which the shaving head 7 rests on the skin 27 during operation.

As Fig. 1 schematically indicates, during operation, the cutting members 9, 11 are driven into a periodical motion P relative to the base portion 3 and relative to the shaving head 7. In the embodiment shown, the periodical motion P is a reciprocating motion relative to the skin contact member 17 of the shaving head 7 in a direction substantially parallel to the shaving direction X . The periodical motion P is effected by an electrical actuator of the device 1, which is not shown in Fig. 1 but which will be further described in detail in the following with reference to Figs. 2-5.

As a result of the periodical motion P of the cutting members 9, 11, the hair cutting action of the device 1 is considerably improved. In particular, the user perceives that the cutting forces necessary to cut the hairs growing from the skin 27 are considerably reduced. Consequently, the user can move the shaving head 7 over the skin 27 in a more convenient manner and the user experiences less irritations and pain as a result of the cutting process. As a result, both the shaving performance and the shaving comfort of the device 1 are considerably improved. In order to further improve the shaving performance and the shaving comfort and, in particular, to reduce the risk of skin irritations and skin injuries, the device 1 according to the invention comprises a pivot axis 25 about which the shaving head 7

is pivotable relative to the base portion 3. In the embodiment shown in Fig. 1, the pivot axis 25 extends parallel to the skin contact surface 23 and parallel to the straight cutting edges 13, 15 of the cutting members 9, 11, and, seen in the main cutting direction or shaving direction X, the pivot axis 25 is situated in front of the cutting edge 13 of the front cutting member 9. As a result of the pivot axis 25, during operation, the position and orientation of the shaving head 7 on the skin 27 are less dependent on or even independent of the manner in which the user holds the grip 5 in his hand and holds the device 1 with respect to the skin surface. The pivot axis 25 achieves that, when the device 1 is used in a common way, the shaving head 7 is always in optimum contact with the skin 27 under the influence of contact forces between the shaving head 7 and the skin 27, i.e. the skin contact surface 23 is always in substantially complete contact with the skin 27. This means that the geometrical path, which is followed by the cutting members 9, 11 during the periodical motion, has a well-defined position and orientation with respect to the skin surface. As a result, the position and orientation of said geometrical path with respect to the skin surface can be optimized during the design phase of the device 1 and the shaving head 7 in order to provide an optimum reduction of the risk of skin irritations and skin injuries. In the embodiment shown in Fig. 1, the geometrical path of the reciprocating motion P of the cutting members 9, 11 is substantially parallel to the skin contact surface 23.

In the embodiment shown in Fig. 1, the contact pressure between the cutting edges 13, 15 of the cutting members 9, 11 and the skin surface during operation is less dependent on the force with which the user presses the shaving head 7 on the skin 27 as a result of the fact that the pivot axis 25 is situated in front of the cutting edge 13 of the front cutting member 9. As a result, the shaving performance and the shaving comfort provided by the device 1 are less dependent on said force exerted by the user. In the embodiment shown in Fig. 1, said skin contact pressure exerted by the cutting members 9, 11 on the skin 27 is mainly defined by the pretensioning force of a pretensioning member 29. In the embodiment shown, the pretensioning member 29 comprises a mechanical spring 31 which is mounted to the shaving head 7 and to the base portion 3 in order to exert a pretensioning mechanical torque T on the shaving head 7 about the pivot axis 25. The pretensioning mechanical torque T can be optimized during the design phase of the device 1 and the shaving head 7 in order to provide an optimum shaving performance and an optimum shaving comfort which are less dependent on the manner in which the user manipulates the device 1.

The device 1 is shown in more detail in Figs. 2-5, wherein parts of the device 1 already described herebefore are indicated with corresponding reference numbers. As

shown in Fig. 2, the base portion 3 comprises a hollow tube 33 in which the electrical actuator mentioned herebefore is arranged. In the embodiment shown, the actuator is an electrical rotary motor 35 having an output shaft 37. The base portion 3 further comprises a coupling member 38 by means of which the shaving head 7 can be releasably coupled to the base portion 3 in a manner to be described in detail hereafter.

As shown in Fig. 2, the shaving head 7 comprises a frame having two side portions 39, 41 and a bottom portion 43 connecting the side portions 39, 41. As shown in Figs. 3 and 4, each side portion 39, 41 accommodates a supporting plate 45. The two supporting plates 45 together carry the cutting members 9, 11, which are fixed to suspension elements 47, 49 of the supporting plates 45. It is noted that the cutting members 9, 11 and the bottom portion 43 are not shown in Fig. 3 for the sake of simplicity. As shown in Fig. 4, each supporting plate 45 is movably guided relative to the relevant side portion 39, 41 in a direction parallel to the shaving direction X by means of two rectangular openings 51, 53 provided in the supporting plate 45 and two rectangular guiding elements 55, 57 mounted to the relevant side portion 39, 41. The shaving head 7 further comprises a main shaft 59, which extends parallel to the cutting edges 13, 15 of the cutting members 9, 11 and which is rotatably journalled relative to the side portions 39, 41. As shown in Fig. 4, both end portions of the main shaft 59 are provided with a circular eccentric member 61, which fits substantially without clearance in a circular opening 63 provided in a rectangular driving element 65. The driving element 65 is slidable in a Z-direction perpendicular to the shaving direction X and perpendicular to the cutting edges 13, 15 in a further rectangular opening 67 provided in the supporting plate 45, but fits substantially without clearance in said opening 67 in the shaving direction X. Thus, by means of the eccentric members 61, the driving elements 65, and the further rectangular openings 67, a rotational motion R of the main shaft 59 is converted into a reciprocating motion P of the supporting plates 45 and the cutting members 9, 11 mounted thereto in a direction parallel to the X-direction.

As Figs. 2 and 3 further show, the shaving head 7 comprises an input shaft 69 and a gear system 71 for converting a rotational motion of the input shaft 69 into a rotational motion of the main shaft 59. The input shaft 69 extends through a coupling member 73 of the shaving head 7 via which the input shaft 69 can be releasably coupled to the output shaft 37 of the motor 35. As further shown in Figs. 2 and 3, each side portion 39, 41 of the shaving head 7 comprises a circular coupling and pivot member 75 comprising a circular guiding channel 77. The coupling member 38 of the base portion 3 comprises two flexible legs 79, 81, each leg 79, 81 carrying a curved coupling and guiding element 83 on its end portion.

When the shaving head 7 is coupled to the base portion 3, the coupling and guiding elements 83 are accommodated in the guiding channels 77 of the coupling and pivot members 75. The coupling and guiding elements 83 are not visible in Figs. 2 and 3, but Fig. 5 shows one of the coupling and guiding elements 83 accommodated in the respective guiding channel 77. In radial direction relative to the guiding channels 77, the curved coupling and guiding elements 83 fit substantially without clearance in the guiding channels 77 over their entire length, so that the coupling and guiding elements 83 only allow a rotation of the shaving head 7 relative to the base portion 3 about a common central axis 84 of the guiding channels 77. Accordingly, said central axis 84 defines the pivot axis 25 of the shaving head 7 relative to the base portion 3. The shaving head 7 can easily be released from the base portion 3 by pressing the flexible legs 79, 81 towards each other, so that the coupling and guiding elements 83 are released from the guiding channels 77, and by decoupling the input shaft 69 from the output shaft 37 via a simple axial motion of the shaving head 7 away from the base portion 3.

The mechanical spring 31 mentioned before is visible in Figs. 2 and 3 and is arranged around the input shaft 69 of the shaving head 7. The spring 31 abuts against a first abutment surface 85, which is provided on the coupling member 73, and against a second abutment surface, which is not visible in Figs. 2 and 3 and is provided inside the gear system 71. The mechanical spring 31 is subject to a pretensioning pressure force, so that the spring 31 exerts the required pretensioning mechanical torque T on the shaving head 7 in the required direction as shown in Fig. 3.

As described before, the output shaft 37 of the motor 35, the input shaft 69 of the shaving head 7, the gear system 71, the main shaft 59, and the supporting plates 45 together form a transmission system via which the motor 35 arranged in the base portion 3 effects the periodical motion P of the cutting members 9, 11. Thus, said transmission system is partially arranged in the base portion 3 and partially arranged in the shaving head 7. In this manner, the structure of the shaving head 7 is simplified and the dimensions of the shaving head 7 are considerably reduced. Thus the shaving head 7 is suitable as a detachable shaving head, which can be removed from the base portion 3 and exchanged by a new shaving head 7 when the cutting members 9, 11 are worn out.

In the embodiment described before, the periodical motion P of the cutting members 9, 11 has a frequency of approximately 200 Hz. In this embodiment the eccentricity A (see Fig. 4) of the eccentric members 61 is approximately 0,2 mm, so that the periodical motion P has an amplitude of approximately 0,2 mm. In general, the preferred frequency of

the periodical motion P is between approximately 100 Hz and 1000 Hz, while the preferred amplitude of the periodical motion P is between approximately 0,05 mm and 0,3 mm. It is however noted that the values of the frequency and amplitude of the periodical motion P may also be outside said preferred ranges.

It is noted that the invention also covers embodiments of a device for shaving hairs having a different kind and/or a different number of blade-shaped cutting members. The device may, for example, have one single blade-shaped cutting member or more than two blade-shaped cutting members. Instead of the cutting members 9, 11 used in the device 1 described herebefore, a device for shaving hairs in accordance with the invention may, for example, have a thin perforated cutting foil. Such a foil may have a regular pattern of perforations or openings, each such perforation or opening in the foil having a cutting edge.

It is further noted that the invention also covers embodiments of a device for shaving hairs in which the periodical motion of the cutting member(s) is different from the reciprocating motion (P) of the cutting members 9, 11 of the device 1. The periodical motion may, for example, have an elliptical path in an imaginary plane perpendicular to the skin contact surface or a circular or elliptical path in an imaginary plane parallel to the skin contact surface. In order to achieve a considerable improvement of the cutting action of the cutting member(s), it is preferred that the periodical motion of the cutting member(s) has a motion component which extends substantially parallel to the main cutting direction or shaving direction X of the cutting member, as is the case in the device 1 and also in the alternative devices having the elliptical or circular motions mentioned herebefore. In such preferred embodiments, it is further preferred that the pivot axis of the shaving head extends substantially parallel to the skin contact surface and substantially perpendicularly to the main cutting direction or shaving direction X, as is also the case in the device 1, in order to provide an optimal skin-contour following ability of the shaving head. It is however noted that the invention also covers embodiments in which the periodical motion of the cutting member(s) does not have such a motion component parallel to the main cutting direction, for example an embodiment in which a blade-shaped cutting member with a single straight cutting edge reciprocates in a direction parallel to the cutting edge. It is further noted that, in embodiments with two or more cutting members, each cutting member may be subject to a different periodical motion.

It is further noted that the invention also covers embodiments in which the shaving head 7 is not releasable from the base portion 3. In such an alternative embodiment, the cutting member(s) or a sub-frame carrying the cutting member(s) may be releasably

mounted to the shaving head, so that the cutting member(s) or said sub-frame can be removed from the shaving head and exchanged by (a) new cutting member(s) or by a sub-frame carrying (a) new cutting member(s) when the cutting members are worn out.

It is further noted that the invention also covers embodiments which do not have a pretensioning member to better define the skin contact pressure exerted by the cutting member(s) on the skin, or which have a different kind of pretensioning member. An example of such an alternative embodiment is a device in which the shaving head is pivoted relative to the base portion, and in which the cutting members are arranged in a sub-frame which is suspended in the shaving head via a pretensioning member, preferably one or more than one mechanical spring.

It is finally noted that the invention also covers embodiments in which the actuator for effecting the periodical motion of the cutting member(s) is arranged in the shaving head. In such an embodiment the actuator may, for example, be a piezo-electric actuator having sufficiently small dimensions.

CLAIMS:

1. A device for shaving hairs growing from skin, comprising a base portion having a grip, a shaving head carrying at least one blade-shaped cutting member having at least one cutting edge, and an actuator for effecting a periodical motion of the cutting member relative to the base portion, characterized in that the shaving head is pivotable relative to the base portion about a pivot axis, and the periodical motion of the cutting member is a periodical motion relative to the shaving head.

2. A device as claimed in claim 1, characterized in that the shaving head comprises a skin contact member defining a skin contact surface, the pivot axis extending substantially parallel to the skin contact surface.

3. A device as claimed in claim 1, characterized in that the periodical motion has a motion component which extends substantially parallel to a main cutting direction of the cutting member, the pivot axis extending substantially perpendicularly to the main cutting direction.

4. A device as claimed in claim 3, characterized in that the periodical motion is a reciprocating motion in a direction substantially parallel to the main cutting direction.

5. A device as claimed in claim 3, characterized in that the cutting member comprises a single straight cutting edge, the pivot axis extending parallel to the cutting edge and, seen in the main cutting direction, being arranged in front of the cutting edge.

6. A device as claimed in claim 1, characterized in that the device further comprises a pretensioning member which defines a skin contact pressure exerted by the cutting member on the skin during operation.

7. A device as claimed in claim 6, characterized in that the pretensioning member comprises a mechanical spring mounted to the shaving head and to the base portion for exerting a pretensioning mechanical torque on the shaving head about the pivot axis.

8. A device as claimed in claim 1, characterized in that the actuator is arranged in the base portion and effects the periodical motion of the cutting member via a transmission system which is partially arranged in the base portion and partially arranged in the shaving head.

9. A device as claimed in claim 1, characterized in that the shaving head is releasably mounted to the base portion.

10. A device as claimed in claim 1, characterized in that the cutting member is releasably mounted to the shaving head.

11. A shaving head suitable for use in a device for shaving hairs growing from skin, the shaving head carrying at least one blade-shaped cutting member having at least one cutting edge, the shaving head further comprising a coupling member by means of which the shaving head can be coupled to a base portion of said device, said base portion comprising a grip and an actuator for effecting a periodical motion of the cutting member relative to the base portion, characterized in that the periodical motion of the cutting member is a periodical motion relative to the shaving head, and the shaving head comprises a pivot member by means of which, in a condition mounted to the base portion, the shaving head is pivotable relative to the base portion about a pivot axis.

ABSTRACT:

The invention relates to a device (1) for shaving hairs growing from skin (27). The device comprises a base portion (3) having a grip (5). The device further comprises a shaving head (7) which carries at least one cutting member (9, 11) having at least one cutting edge (13, 15). The device has an actuator (35) for effecting a periodical motion (P) of the cutting member relative to the base portion in order to improve the cutting action of the cutting member.

According to the invention, the shaving head (7) is pivotable relative to the base portion (3) about a pivot axis (25), and the periodical motion (P) of the cutting member (9, 11) is a periodical motion relative to the shaving head. As a result, the position and orientation of the shaving head relative to the skin (27) are less dependent on the manner in which the user holds the device (1) in his hand and positions the device relative to the skin. In this manner, the position and orientation of the geometrical path of the periodical motion of the cutting member relative to the skin is well-defined, so that the risk of skin irritations and skin injuries is considerably reduced.

Fig. 1

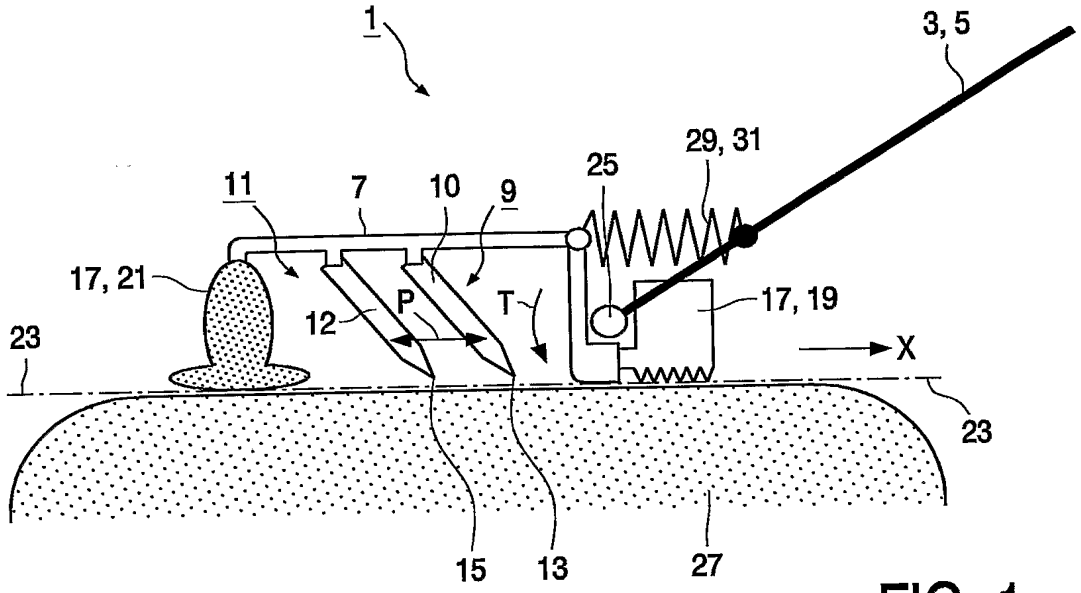
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FIG. 1

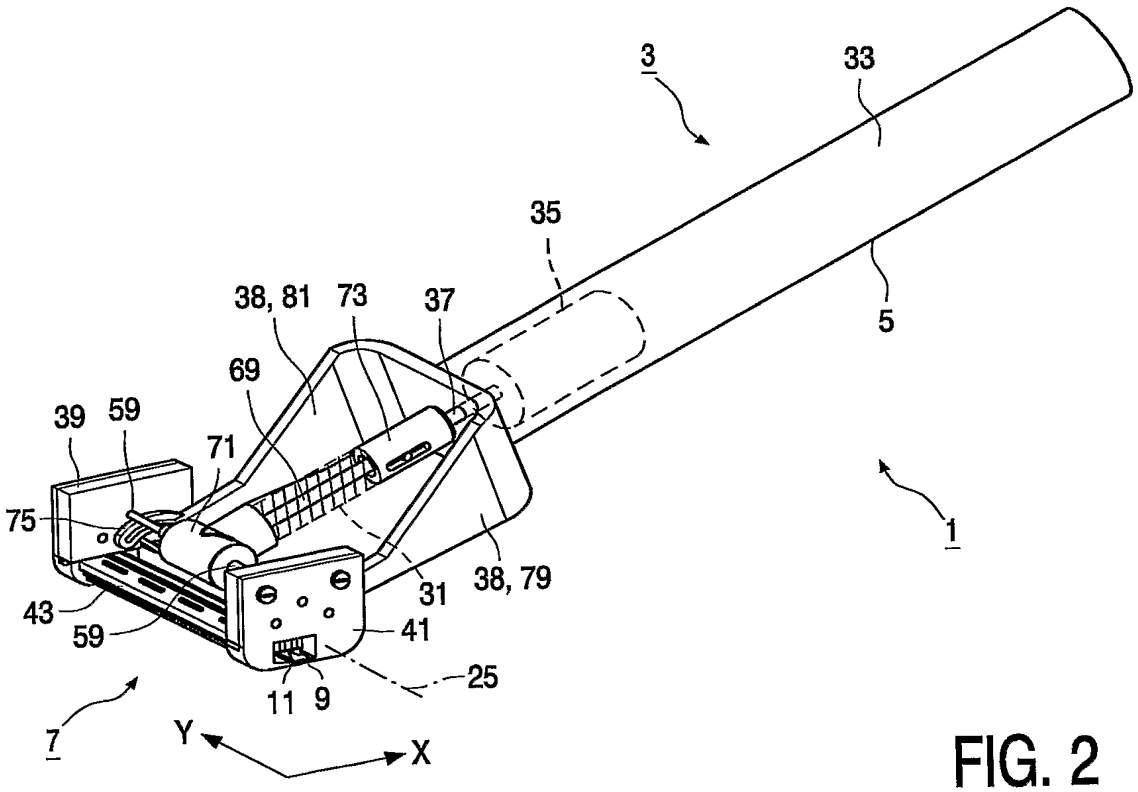
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FIG. 2

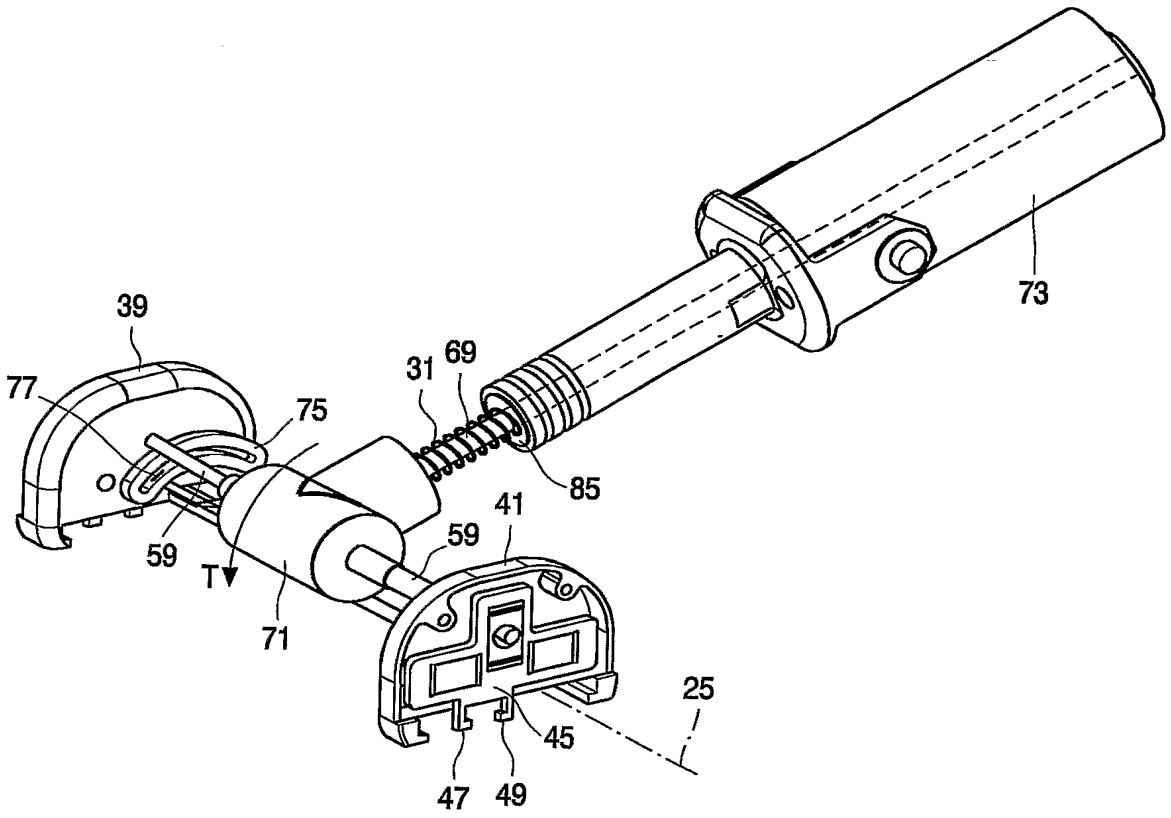

FIG. 3

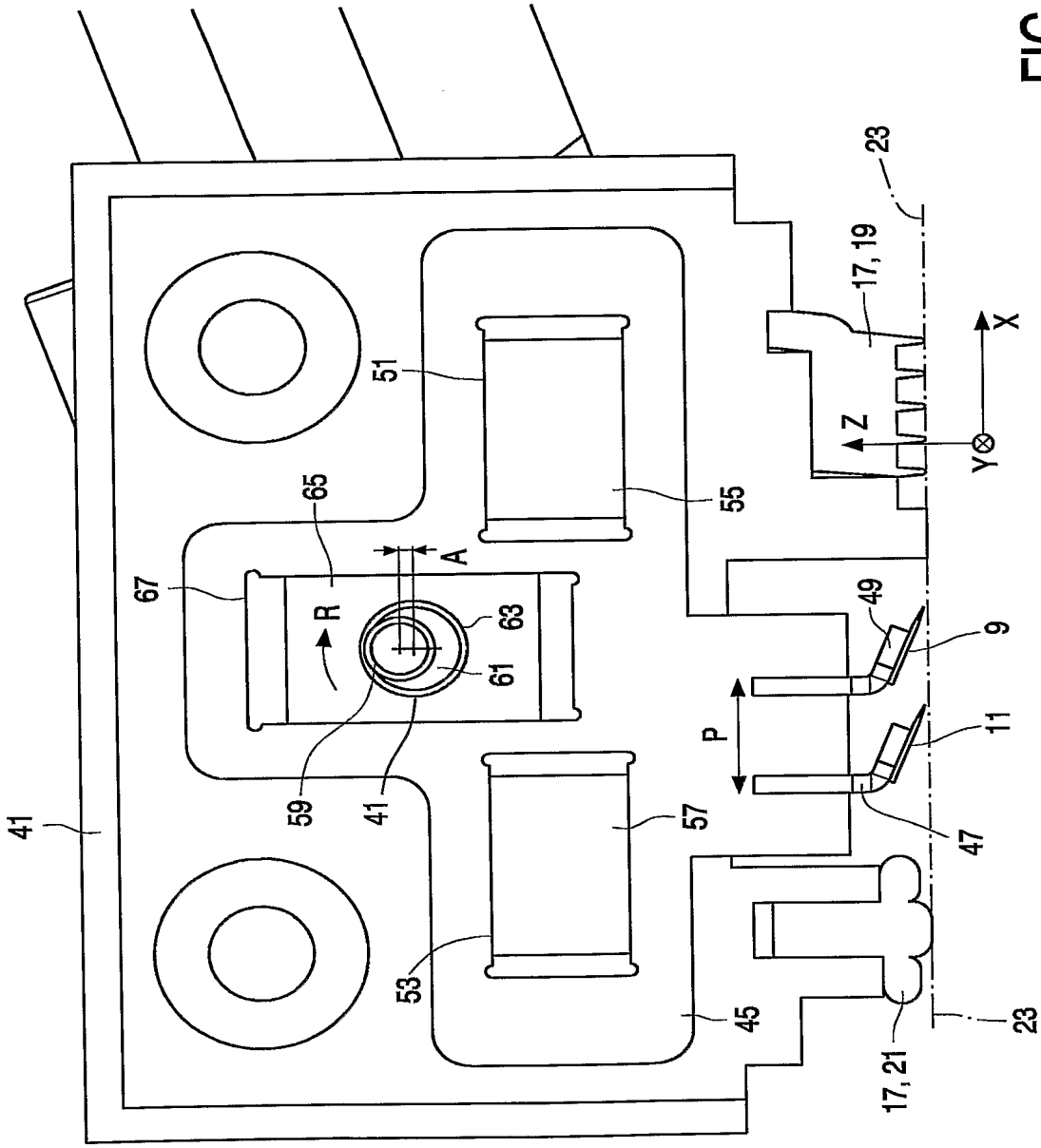

FIG. 4

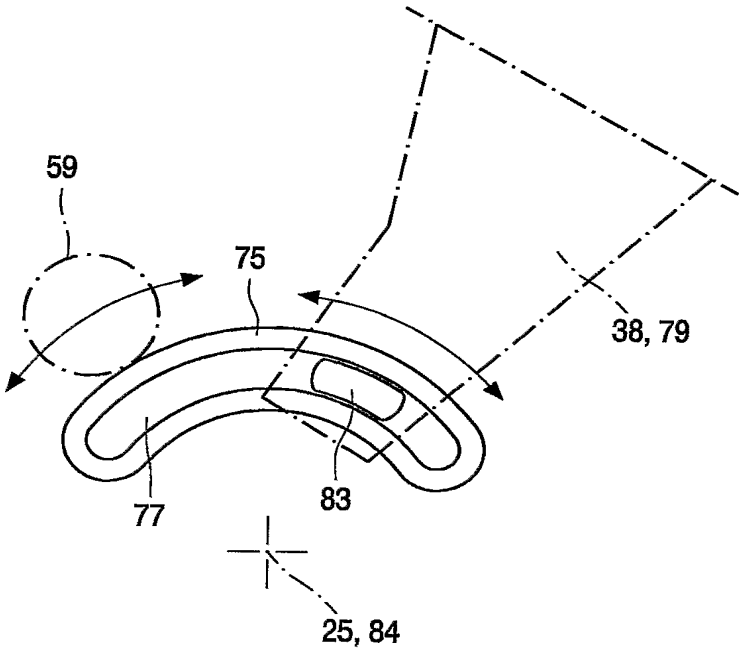

FIG. 5